

What is Claimed is:

1           1.     A method of determining a location of an impact of a projectile upon a target  
2     space comprising:

3           (a)    receiving projectile impacts upon an impact device surface, wherein said  
4     impact device includes a plurality of layers, and wherein at least one of the plurality of layers  
5     includes an electrically conducting sensor layer with at least one electrical property that  
6     changes in response to the impact from the projectile; and

7           (b)    monitoring the sensor layer of the impact device and determining a location of  
8     the projectile impact upon the impact device surface.

1           2.     The method of claim 1, wherein step (a) further includes:

2           (a.1)   applying an electrical signal of known magnitude across the sensor layer.

1           3.     The method of claim 1, wherein step (b) further includes:

2           (b.1)   measuring the electrical property at a plurality of measurement locations upon  
3     the sensor layer to establish a reference measurement for each of said plurality of  
4     measurement locations.

1           4.     The method of claim 3, wherein step (b) further includes:

2           (b.2)   sampling the electrical property at said plurality of measurement locations to  
3     obtain a sample measurement at each of said plurality of measurement locations and  
4     comparing each of the sample measurements to a corresponding reference measurement to  
5     determine a deviation from the corresponding reference measurement.

1           5.     The method of claim 4, wherein step (b) further includes:

2           (b.3)   determining the impact location of the projectile upon the impact device based  
3     upon the determined electrical property deviations.

1           6.     The method of claim 1, wherein the impact device is physically aligned with a  
2     target space corresponding to at least one of a physical target and a generated virtual target,

3 and step (b) further includes:

4 (b.1) correlating the impact device with the target space by associating at least one  
5 location upon the impact device with at least one corresponding location within the target  
6 space.

1 7. The method of claim 1, wherein the impact device is transparent and the  
2 impact device is aligned in front of the target space.

1 8. The method of claim 1, wherein the impact device is opaque and the impact  
2 device is aligned behind the target space.

1 9. The method of claim 1, further including:

2 (c) displaying at least one of a score value, an elapsed time between projectile  
3 impacts and an impact location on a target image.

1 10. The method of claim 1, wherein step (b) further includes:

2 (b.1) calibrating the determined impact location to account for environmental  
3 conditions.

1 11. The method of claim 5, wherein step (b.3) further includes:

2 (b.3.1) processing the deviations in accordance with electronically stored instructions.

1 12. The method of claim 4, wherein step (b.2) further includes:

2 (b.2.1) comparing the determined deviation to a pre-defined threshold value; and

3 (b.2.2) determining the presence of a projectile impact in response to the determined  
4 deviation exceeding the pre-defined threshold value.

1 13. The method of claim 1, wherein said at least one electrical property includes  
2 the resistance of the sensor layer.

1 14. The method of claim 1, wherein said at least one electrical property includes

2 the capacitance of the sensor layer.

1 15. The method of claim 1, wherein step (a) further includes:

2 (a.1) calibrating the impact device by impacting the impact device surface at a  
3 location physically adjacent to a predefined location within the target space.

1 16. A target assembly for determining a location of an impact of a projectile upon  
2 a target space, the target assembly comprising:

3 an impact device to receive a projectile impact upon a surface thereof, wherein the  
4 impact device includes a plurality of layers, and wherein at least one of the plurality of layers  
5 includes an electrically conducting sensor layer with at least one electrical property that  
6 changes in response to the impact from the projectile; and

7 a monitoring module to monitor the sensor layer of the impact device and determine a  
8 location of the projectile impact upon the impact device surface.

1 17. The target assembly of claim 16, wherein the monitoring module further  
2 includes:

3 a sensor power module to apply an electrical signal of known magnitude across the  
4 sensor layer.

1 18. The target assembly of claim 16, wherein the monitoring module further  
2 includes:

3 a reference module to measure the electrical property at a plurality of measurement  
4 locations upon the sensor layer to establish a reference measurement for each of said plurality  
5 of measurement locations.

1 19. The target assembly of claim 18, wherein the monitoring module further  
2 includes:

3 a sampling module to sample the electrical property at said plurality of measurement  
4 locations to obtain a sample measurement at each of said plurality of measurement locations  
5 and to compare each of the sample measurements to a corresponding reference measurement

6 to determine a deviation from the corresponding reference measurement.

1 20. The target assembly of claim 19, wherein the monitoring module further  
2 includes:

3 an assessment module to determine the location of the projectile impact upon the  
4 impact device surface based upon the determined electrical property deviations.

1 21. The target assembly of claim 16, wherein said monitoring module includes:  
2 a controller module to receive the impact location information from the monitoring  
3 module and determine a location of impact upon a target space that is aligned with said  
4 impact device.

1 22. The target assembly of claim 21, wherein the impact device is physically  
2 aligned with a target space defined by at least one of a physical target and a generated virtual  
3 target, and wherein the controller module further includes:

4 a correlation module to correlate the impact device with the target space by  
5 associating at least one location upon the impact device with at least one corresponding  
6 location within the target space.

1 23. The target assembly of claim 16, wherein the impact device is transparent.

1 24. The target assembly of claim 16, wherein the target assembly further includes:  
2 a display interface to communicate with at least one of an external display and a  
3 computer system to display at least one of a score value, an elapsed time between projectile  
4 impacts and an impact location on a target image.

1 25. The target assembly of claim 21, wherein the controller module further  
2 includes:

3 a calibration module to calibrate the determined impact location to account for  
4 environmental conditions.

1        26.    The target assembly of claim 16, wherein the target assembly further includes:  
2            a memory module that stores electronic processing instructions.

1        27.    The target assembly of claim 19, wherein the monitoring module further  
2   includes:

3            a threshold module to compare a determined deviation to a pre-defined threshold  
4   value to determine the presence of a projectile impact in response to the deviation exceeding  
5   a pre-defined threshold value.

1        28.    The target assembly of claim 16, wherein said at least one electrical property  
2   includes the resistance of the sensor layer.

1        29.    The target assembly of claim 16, wherein said at least one electrical property  
2   includes the capacitance of the sensor layer.